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PHYSICS.—*The spectral photoelectric sensitivity of molybdenite as a function of the applied voltage.* W. W. COBLENTZ and H. KAHLER, Bureau of Standards.

In a previous investigation it was observed that the spectral photoelectric sensitivity of molybdenite is confined practically within three spectral bands, the maxima of which are separated by equal intervals, when plotted in terms of frequency instead of wave lengths.

The present investigation was undertaken in order to test the validity of this frequency relation, using for the purpose a quartz prism which gave twice the dispersion formerly obtained with a fluorite prism. The sample of molybdenite was soldered to copper wire terminals, and operated in an evacuated chamber as in previous work. The photoelectric substance, the dry battery and the d'Arsonval galvanometer were connected in series. The deflection caused by the small dark current was overcome by rotating the suspension head of the galvanometer.

The results obtained with this apparatus appear to verify the previous observations, indicating that the frequency maxima of photoelectrical sensitivity are separated by equal intervals, which decrease with temperature; the arbitrary wave-number being $n = 40$ at 25°C. and $n = 30$ at —175°C.

A new voltage phenomenon.—A photo-negative action (resistance increase) has been observed in certain samples of selenium,[1] when exposed to the total radiation from an incandescent

[1] RIES, Phys. Zeits. 9: 569. 1908. BROWN, Phys. Rev. 33: 1. 1911.

lamp. A similar spectral photo-negative response was observed in some samples of stibnite,[2] when exposed to radiations of wave-lengths less than $\lambda = 0.657\ \mu$. But heretofore no one appears to have observed that, for wave-lengths less than about $0.65\ \mu$, the nature of the photoelectric response depends upon the voltage applied to the substance under test.

We have found in some samples of molybdenite that, for the visible spectrum extending to about $\lambda = 0.647\ \mu$, the electric response is photo-positive or photo-negative, depending upon the voltage applied to the terminals of the receiver. For wave-lengths greater than $\lambda = 0.647\ \mu$ the photoelectric response was observed to be photo-positive whatever the applied voltage.

The region of transition in the spectrum, in which the action changes from photo-negative to photo-positive, is very narrow —less than 9 AU.

The critical voltage is very small, as may be inferred from the fact that an increase of 1.3 volts (additional dry cell) changed a positive-negative galvanometer deflection of ± 1 cm. into a purely negative deflection of —24 to —26 cm., which is the photo-negative response under discussion.

There seem to be two contending forces acting. The one which causes the photo-positive response acts quickly and prevails on low voltage. The photo-negative action builds up more slowly and is predominant on high voltages. As a result of these two forces, for certain applied voltages, on exposing the molybdenite receiver to light of wave-lengths less than $0.647\ \mu$, the galvanometer deflection is first positive, then decreases in value (and may even become negative) when, on shutting off the light stimulus, there is a further deflection in the negative direction, after which the deflection returns to the original zero scale reading.

For example, using the wave-length $\lambda = 0.5876\ \mu$ as a light stimulus, and applying a potential of 10 volts, the galvanometer deflection was almost entirely positive. On 20 volts the deflection was partly positive and partly negative. On 29 volts the positive response was almost eliminated, and the negative

[2] ELLIOT, Phys. Rev. **5**: 62. 1915.

response prevailed. On 33 volts the galvanometer deflection was entirely negative and eight times as large as the observed maximum purely positive deflection for 10 volts. In another test, at a slightly lower temperature (—104°C.), which raises the critical voltage, changing from 35.6 volts to 37 volts transformed the positive-negative deflection of ± 5 mm. into a negative deflection of —230 mm.

These tests were carried out at —100°C. to —178°C. It is of interest to note that the photo-positive action is the same as a resistance decrease caused by a rise in temperature of the material, while the photo-negative action is similar to the building up of a counter-electromotive force (the electrolytic action), previously observed in silver sulfide. An equal-energy spectrum was used for the radiation stimulus and if this phenomenon were the result of heating and of electrolytic action, then the photo-positive response should occur in the short wave-lengths where the absorption is greatest, and the photo-negative response should occur in the long wave-lengths where the photo-electric activity is the greatest. This is just the reverse of what has been observed.

No explanation of this phenomenon is attempted at this time. Even if it is "only a gas effect," "electrolytic action" or "surface charge," it is unique in being selective as to the wave-length of the exciting radiation and in being photo-positive or photo-negative, depending upon the applied voltage. It therefore requires further investigation.

GEOCHEMISTRY.—*The oxidation of lava by steam.* J. B. FERGUSON, Geophysical Laboratory, Carnegie Institution of Washington.

Crystals of olivine and other iron-bearing minerals are found associated with glass in the normal Kilauean lava, and some years ago the question arose as to whether their presence might be taken as evidence bearing upon the probable water content of the volcanic exhalations. Preliminary experiments[1] made

[1] DAY, A. L., and SHEPHERD, E. S., *Water and volcanic activity.* Bull. Geol. Soc. Amer. **24**: 602. 1913. Smithsonian Report for 1913, 302 (Publication 2286).

at that time by the writer indicated that the lava was not appreciably attacked by water vapor at temperatures in the neighborhood of 1000°C. and that the presence in the lava of so much iron in the ferrous condition was not at variance with the water content of the emanations observed by Day and Shepherd.[2] These experimental results, obtained in 1912 and 1913, are now presented as a matter of record.

Most of the writers who have speculated upon the rôle that water plays in the chemical reactions which take place in the volcanic vent during an eruption have based much of their speculation upon the equation[3]

$$3FeO + H_2O \rightleftarrows Fe_3O_4 + H_2 + 15400 \text{ cal.}$$

This equation must not be taken too literally, because recent investigations[4] have indicated that the action of steam upon a ferrous iron oxide at high temperatures gives rise to a "magnetite" of variable composition. The actual composition obtained is dependent upon the temperature.[5]

An analysis of a fresh flow of Kilauean lava[6] shows 9.28 per cent FeO and 1.92 per cent Fe_2O_3. The ratio of ferrous to ferric iron in this rock is much greater than the ratio in magnetite (1 : 2) and, were we dealing with the pure iron oxides only, this fact might be used as an argument against the presence of a preponderance of water vapor in the gas phase. The lava, however, does not contain ferrous oxide as a separate phase. The ferrous iron exists mainly in the silicate minerals and the glass, together with a little in the traces of magnetite which are probably present, although microscopic examination does not show appreciable amounts of Fe_3O_4. The equations which would

[2] DAY and SHEPHERD, Loc. cit. SHEPHERD, E. S., Bull. Hawaiian Volcano Obs. 7 (July). 1919.

[3] CHAMBERLIN, R. T., Carnegie Publication No. 106: 66. 1903. R. A. DALY, *Igneous rocks and their origin*, p. 272. 1914. VON WOLFF, *Vulkanismus*, I, p. 116. 1914.

[4] HILPERT, S., and BEYER, J., Ber. deutsch. Chem. Ges. 44: 1618. 1911.

[5] The whole problem of the various oxides of iron is an exceedingly difficult one to study experimentally and much yet remains to be done before the problem can be considered satisfactorily solved.

[6] FERGUSON, J. B., Am. Journ. Sci. 37: 400. Analysis B. 1914.

represent the reaction between water and the ferrous iron in the silicates might be quite different in character from the equation given for the pure oxides, and an assumption of analogous behavior in these cases appears to be a somewhat risky matter.[7] Indeed, Thaddéef's[8] results upon the oxidation of olivine by ignition in air indicate that the oxides are much more easily oxidized than is the ferrous iron of the olivine. He found that only two-thirds of the iron present in this silicate could be oxidized by such ignition, whereas it is common knowledge that ferrous oxide would be readily changed to ferric oxide under similar treatment.[9]

My results qualitatively confirm the observations of Thaddéef in this respect and were carried out as follows:

Materials.—A piece of lava from the crater floor of Kilauea was crushed in a hardened steel mortar and the part that passed the twenty but not the forty mesh sieve (0.38–0.86 mm.) and also the part that passed the two hundred mesh sieve (less than 0.074 mm.) were used.

The nitrogen was made from sodium nitrite, or by removal of oxygen from air by copper, and was passed through the usual purifying and drying train.

Apparatus and procedure.—The furnace was a platinum-wound resistance furnace of the type usually employed in this laboratory. The temperatures were determined by means of a platinum-platinrhodium thermoelement and a suitable potentiometer set-up. A long porcelain tube was placed in the furnace so that it projected twenty or thirty cm. out of the furnace at one end and five or six cm. at the other. The charge was placed in a platinum boat in the porcelain tube, and the boat had attached to it a stiff platinum wire which enabled one to insert the boat into the hot portion of the tube or to withdraw it into the colder portion at will.

[7] Such an assumption appears to have been made by Brun, who states that water vapor directly oxidizes the ferrous silicate to magnetite. His statement is not confirmed by analyses of the solid products after reaction with water, but rests on the change in color of the rock and the presence of hydrogen, together with CO and CO_2, in the gases evolved. Arch. sci. phys. nat. 41: 404. 1916.

[8] THADDÉEF, K. Z., Kryst. 26: 77. 1896.

[9] SOSMAN, R. B., and HOSTETTER, J. C., Journ. Amer. Chem. Soc. 38: 820. 1916.

For the steam experiments the steam-generating apparatus was attached to that end of the porcelain tube which projected 5–6 cm. from the furnace. This apparatus consisted of a boiler and pre-heater. The latter also acted as a trap for liquid water. The boiler had two valves so that the water in it could be boiled for some time to expel all oxygen before an experiment was started. The rest of the apparatus was so arranged that it could be initially swept out with pure nitrogen and then, after the steam had been shut off at the close of an experiment, could be again filled with nitrogen. The water that condensed in the cold portion of the porcelain tube was wiped out before the boat was withdrawn. During the wiping-out process and the cooling of the charge an atmosphere of pure nitrogen was maintained.

Typical experiment.—Five grams of lava powder were placed in the platinum boat and the boat placed in the cold end of the porcelain tube. Nitrogen was then admitted to the apparatus and all the air swept out. The boat was then pushed into the hot portion of the porcelain tube. The nitrogen was partly shut off and steam admitted. When a good flow of steam was obtained through the furnace the nitrogen was entirely shut off. The porcelain tube was so tilted that the water condensing in the colder portion of the tube, after passing the hot zone, would drain away from the furnace. After the experiment had run for the desired time the steam was gradually replaced by nitrogen. The liquid water in the end of the porcelain tube was wiped out (a good flow of nitrogen prevented the access of air during this operation) and then the boat was withdrawn to the cold portion of the tube and, when cold, removed. A part of the charge was analyzed for ferrous iron by the modified Pratt method as used by Washington.[10] Calcium phosphate as recommended by Gage was used to aid in the determination of the end points in the permanganate titration.[11] It should be noted that if any of the reducing gases present in the rock dissolved when the rock sample was brought into solution, they would be titrated and would appear as ferrous iron.

[10] WASHINGTON, H. S., *The chemical analysis of rocks*, 2d Ed., p. 136–138. 1910; 3d Ed., p. 186–190. 1919.

[11] Journ. Amer. Chem. Soc. 31: 381–385. 1909.

TABLE 1

RESULTS OF EXPERIMENTS WITH A KILAUEAN LAVA IN CONTACT WITH NITROGEN AND STEAM

Exp. No.	Initial FeO content	Final FeO content	Gas employed	Time of exposure. Hours	Fineness of powder. Meshes per inch	Temp. ° C.	Percentage decrease in FeO	Remarks
1	8.69							
	8.69	7.93	nitrogen	1	20–40	1000	8.8	
	8.71							
2	8.69							
	8.69	7.90	nitrogen	1	20–40	1000	9.2	
	8.71							
3	8.69							
	8.69	8.25	nitrogen	1	20–40	1000	5.2	
	8.71							
4	8.69							
	8.69	8.16	nitrogen and steam	2 (steam)	20–40	1000	6.2	
	8.71							
5	8.69							
	8.69	7.91	nitrogen and steam	2 (steam)	20–40	1000	9.1	
	8.71							
6	8.69							
	8.69	7.98	nitrogen and steam	2 (steam)	20–40	1000	8.3	
	8.71							
7	8.69							
	8.69	7.91	nitrogen and steam	2 (steam)	20–40	1000	9.1	
	8.71							
8	8.69							
	8.69	8.31	nitrogen and steam	1 (steam)	20–40	1100	4.5	
	8.71							
9	8.69							
	8.69	8.37	nitrogen	1	20–40	1100	3.8	
	8.71							
10	9.32	7.84	nitrogen	1½	200	1000	16.1	Air pumped out of charge and replaced by nitrogen before charge inserted into hot part of tube
		7.80						
11	9.32	8.18	nitrogen	¼	200	1000	12.2	
12	9.32	8.06	nitrogen	1	200	1000	13.5	
13	9.32	7.80	nitrogen	1	200	1000	16.3	
14	9.32	7.87	nitrogen	½	200	1000	15.6	
15	9.32	7.93[1]	nitrogen	1	200	1000	14.9	
		7.92[2]					15.0	
16	9.32	7.95	nitrogen and steam	1 (steam)	200	1000	12.5	
		8.37						
17	9.32	8.26	nitrogen 0.1 mm. pressure	½	200	1000	11.4	Time for experiments 2 hrs., including heating and cooling
18	9.32	7.95	nitrogen 0.1 mm. pressure	½	200	1000	14.7	

[1] Top of charge. [2] Bottom of charge.

The results obtained in the experiments at atmospheric pressure and at a low pressure of nitrogen are given in table 1.

In addition, the results of two miscellaneous experiments are given below.

(19) Some of the lava powder was heated in a platinum crucible in air over a Meker burner for two hours. The ferrous iron content was then found to be 1.94 per cent.

(20) Some of the oxidized product obtained in experiment (19) was heated in a partial vacuum (0.1 mm. of nitrogen) for 4 hours at 1100°C. The ferrous iron value was then found to have been raised from 1.94 to 3.90 per cent. A duplicate analysis gave 3.87 per cent.

Discussion.—The results given in table 1 show that after heating there is a decrease in the ferrous iron content of the rock amounting, in terms of the ferrous iron originally present, to 4–9 per cent for the coarse powder and 11–16 per cent for the fine powder. The variations within each group are not traceable in any way to the gas phase present. In fact the steam appears to have acted like an inert gas.[12]

Just what is the complete cause of the decrease noted is somewhat of a question. A certain apparent decrease in the ferrous iron content might be expected from the loss of the reducing gases which are liberated upon heating the lava, and some decrease might also arise from the taking up of some iron by the platinum boat.[13] An actual decrease would occur if part of the ferrous iron were oxidized by adsorbed gases. These effects, would, however, be expected to be small.

The decrease in ferrous iron must therefore be ascribed mainly to some reaction within the lava sample itself. The magnetite which formed when the lava crystallized[14] was probably the last

[12] It cannot be argued that the gas reacted only with the surface material and did not penetrate the charge, for experiment (15) shows that samples from the bottom and top of the charge contain exactly the same amount of ferrous iron. Also it can hardly be argued that there was a surface attack upon the lava grains since the results with both fine and coarse materials show the same independence of the gas phase, and the same final ferrous iron content.

[13] SOSMAN, R. B., and HOSTETTER, J. C., This JOURNAL. 5: 293. 1915.

[14] After an experiment the material was found completely crystallized, although originally containing much glass.

material to dissolve during the decomposition of the sample with hydrofluoric and sulphuric acids, and if the formation of this mineral were at the expense of the oxygen in the remainder of the lava, the analytical results would probably not indicate this but would rather show merely less ferrous iron. The mechanism of such a reaction within the lava with the formation of magnetite can only be speculated upon. Sosman[15] has suggested the possibility of the presence of iron (Fe) in solution in the glass or minerals after this reaction. Another possible reaction would be the formation of a lower oxide of titanium than the TiO_2 usually reported.

The fact that both the fine and coarse material, although of slightly different initial ferrous iron content, contain practically the same percentages after treatment is probably traceable to the larger percentage of glass and smaller percentage of Fe_3O_4 in the fine material.

Whatever the cause of the small decrease in ferrous iron, and of the variations therein, the experiments leave no doubt that considerable ferrous iron, when in silicate combinations, can exist in the presence of water vapor at high temperatures.

The vacuum experiment (No. 20) with the oxidized material shows clearly the ease with which oxygen can be removed from such materials and indicates that due regard must be given to this phenomenon not only in the study of the chemistry of lavas, but also in the interpretation of the results obtained in experiments in which gases are pumped from rocks at high temperatures.

The data given in this article are of a qualitative rather than a quantitative character, and are not to be regarded as final data on the reactions of water vapor with iron-bearing silicates. The complete story cannot be obtained by experiments on so complex a material as a natural lava, but must be learned by experiments with simple silicates of known composition. These results are presented here, however, on account of their current interest and in the absence of any fundamental data on the reactions concerned.

[15] Private communication; see also this JOURNAL. 7: 58. 1917.

The microscopic examination of the samples was made by H. E. Merwin of this Laboratory.

RECAPITULATION

Under certain conditions steam is capable of oxidizing iron and its lower oxides to magnetite, Fe_3O_4, or to ferric oxide, Fe_2O_3. This fact has often been quoted as an indication of the probable oxidizing action of steam upon lava during volcanic activity. In this paper this reasoning from analogy is subjected to the light of recent investigations and found wanting. In addition, some experimental results are given which confirm the view that the ferrous iron is not thus oxidized, and indicate that the presence of much ferrous iron in the lava and much steam in the volcanic emanations of Kilauea are two facts which are in full accord. Several miscellaneous experiments are also reported which show that in the experimental study of the chemistry of the lavas careful attention must be paid to the character of the gas phase in contact with the lava if results of value are to be obtained. The bearing of these experiments upon the interpretation of the results obtained by pumping gases from rocks at high temperatures need only be mentioned.

BOTANY.—*History of the Mexican grass*, Ixophorus unisetus. A. S. HITCHCOCK, Bureau of Plant Industry.

In 1791 Thaddeus Haenke, a Bohemian botanist accompanying Malaspina on an exploring expedition to the Pacific coast of America, visited Mexico, stopping at San Blas and Acapulco. From the latter place he visited the interior of the country. His collections were sent to Prague and were examined by the botanists J. S. Presl and C. B. Presl, who finally published an account of a few families, including the grasses,[1] under the title, *Reliquiae Haenkeanae*. In this work 15 genera and about 250 species of grasses were described as new. They came from the western coast of South America, Panama, Mexico, Monterey (California), Nootka Sound (Vancouver Island), and the Philippine and Marianne Islands. Some of the species, supposed to be new, proved to be the same as others previously described,

[1] PRESL, Rel. Haenk. 1: 207–349, pl. 37–48. 1830.

but a large number are still maintained as valid. The plants were deposited at the Bohemian Museum but, when the German University was established, the collections were divided, a part going to each institution. In 1907 the writer found a part of the Haenke grasses at the Bohemian Museum and a part at the German University. The labels on the specimens are meager, usually merely a single word, such as Mexico, Panama, Acapulco, and sometimes even this lacking. There is not always an agreement between the label on the specimen and the locality as published by Presl, and in a few cases there is evidence that the labels have been misplaced.

The grass under consideration was described as *Urochloa uniseta*. The genus Urochloa was based upon *Urochloa panicoides*,[2] a species of Panicum from Île de France (Mauritius), referred to later in this article. This species has the spikelets in one-sided spikelike racemes with one or two slender stiff hairs on the pedicel below the spikelets. In Presl's species the spikelets are in similar one-sided spikes and are subtended by bristles, a single one below each spikelet, these bristles being, however, sterile branchlets instead of hairs or trichomes as in *Urochloa panicoides*. The locality of *U. uniseta* as published is merely Mexico. The type specimen, at the German University, is labeled, "Urochloa uniseta Pr. Mexico, H." It is the upper part of a culm bearing three leaves and a panicle of about 20 spikes.

In 1834 Trinius, in revising the section Setaria of the genus Panicum, remarked that Presl's *Urochloa uniseta*, which apparently he had not seen, probably belonged in Setaria and named it *Panicum unisetum*.

In 1862 Schlechtendahl revised Setaria and its allies and established the genus Ixophorus, basing it upon *Urochloa uniseta* Presl. He also mentioned a specimen collected by Schiede, which he called *I. schiedeana*. This species is not described, the author merely saying that it is more delicate and the bristles are thinner and longer.

In 1886 Fournier, who wrote an account of the grasses of Mexico, described a new species of Setaria, which he called *S. cirrhosa*,

[2] Beauv. Ess. Agrost. 52. pl. 11. fig. 1. 1812.

based upon a specimen (No. 387) collected at San Agustin (Oaxaca) by Liebmann, a Danish botanist, who made extensive collections in Mexico (Vera Cruz and Oaxaca). The type specimen of this species was kindly sent for examination by the Director of the Botanical Museum at Copenhagen. It proves to be the same as *Ixophorus unisetus*. The specimen bears, in Fournier's handwriting, the name *Panicum cirrhosum* Fourn. n. sp., a name which, in publication, he changed to *Setaria cirrhosa*.

The species just mentioned is the fifth species of Setaria in Fournier's account. His sixth is *Setaria uniseta*, based upon *Urochloa uniseta* Presl. As number seven he lists without description *Setaria schiedeana*, based on *Ixophorus schiedeanus* Schlecht., stating that he has not seen this and that Schlechtendahl does not describe it, thus inflicting on the botanist another nomen nudum.

Thus the species remained until 1893, when several manuscript descriptions of Dr. George Vasey were published after his death. Under the name *Panicum* (*Ptychophyllum*) *palmeri* Vasey is published a new species based on a specimen collected by Dr. E. Palmer at Tequila, Jalisco, in 1886. Vasey remarked that this is near *Setaria cirrhosa* Fourn. Vasey referred this to the section Ptychophyllum of Panicum because of the single bristle below the spikelets, because of the inflorescence, which resembles that of *P. sulcatum*, and perhaps because of the rather broad blades.

In 1895 Dr. J. N. Rose published an account of the plants collected in Mexico by Dr. E. Palmer in 1890 and 1891. Among the grasses is a new species credited to Dr. Vasey, *Panicum* (*Ptychophyllum*) *pringlei*. The specimens mentioned are *Pringle* 2047 and 2423, and *Palmer* 1256 in 1891. All are small forms of *Ixophorus unisetus*. Because of the specific name and because Dr. Vasey has written the name upon *Pringle* 2423, this specimen is the type.

In 1896 Beal published the same species as new under the name *Panicum schiedeanum* "Trin. ex. Steud. Nom. Ed. 2, 2: 263 (1841). P. Pringlei Vasey in ed.," basing it on Pringle's No. 2423 from Jalisco, which is the type of *Panicum pringlei*. Beal

uses the name *P. schiedeanum* because it appears on the printed labels of the plants distributed by Pringle (No. 2423). The citation given by Beal, however, is a nomen nudum (a name without description or citation of a synonym). A specimen in the Trinius Herbarium labeled *Panicum schiedeanum* is a species of Paspalum. Beal gives *Panicum palmeri* Vasey on a succeeding page as a distinct species.

In 1897 Scribner revised the genus Ixophorus, describing *I. unisetus*, *I. pringlei* Scribn. "(*Panicum schiedeanum* Beal, not Trin.)," and *I. pringlei* var. *minor* Scribn.

The descriptions of the forms do not differ except in the size of the vegetative parts, the specimens assigned to *I. pringlei* being smaller, the blades shorter and narrower, and the spikes fewer and shorter. The variety is a still more depauperate form, with blades only 1 to 3 inches long (*Palmer* 1256 in 1891 from Colima, Mexico).

Finally, in 1900, Scribner and Merrill, in their revision of the genus Chaetochloa (Setaria), listed among the excluded species *Setaria cirrhosa* Fourn. (see above), which they refer to *Panicum* as *P. cirrhosum*. In this they depended upon Fournier's description as they had not seen the single collection cited by him.

The above account of the nomenclatorial history of a little-known species is instructive as showing how variable are the judgments of different botanists, or of the same botanist at different times, when working with inadequate material. The single species has been described under five different specific names and has been referred to four genera. Fournier had not seen Presl's specimen and American authors had not seen Fournier's nor Presl's specimens. Only recently has there been sufficient material to confirm the judgment that all the forms belong to one species.

A peculiarity of the sterile palea is worthy of note. At first the margins, wide and thin, overlap and inclose the three large anthers of the sterile or lower floret. At maturity the margins expand and spread around the sterile lemma, appearing winglike and papery. This expansion appears to be rather sudden as it is observed only in specimens with fruiting spikelets.

Ixophorus unisetus is cultivated in Costa Rica as a forage grass under the name of Honduras grass (Zacate de Honduras).

The synonymy of the species and a list of the specimens in the National Herbarium follow:

IXOPHORUS UNISETUS (Presl) Schlecht.

Urochloa uniseta Presl, Rel. Haenk. 1: 319. 1830.

Panicum unisetum, Trin. Mem. Acad. St. Pétersb. VI. Sci. Nat. 1: 217. 1834.

Ixophorus unisetus Schlecht., Linnaea 31: 421. 1862.

Ixophorus schiedeanus Schlecht. Linnaea 31: 421. 1862.

Setaria schiedeana Fourn., Hemsl. Biol. Centr. Amer. Bot. 3: 505. 1885.

Setaria uniseta Fourn., Hemsl. Biol. Centr. Amer. Bot. 3: 506. 1885.

Setaria cirrhosa Fourn., Mex. Pl. 2: 43. 1886.

Panicum palmeri Vasey, Contr. U. S. Nat. Herb. 1: 281. 1893.

Panicum pringlei Vasey, Contr. U. S. Nat. Herb. 1: 363. 1895.

Panicum schiedeanum Trin., Beal, Grasses N. Amer. 2: 119. 1886.

Ixophorus pringlei Scribn., U. S. Dept. Agr. Div. Agrost. Bull. 4: 6. pl. 2. 1897.

Ixophorus pringlei minor Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 4: 7. 1897.

Panicum cirrhosum Scribn. & Merr., U. S. Dept. Agr. Div. Agrost. Bull. 21: 40. 1900.

DISTRIBUTION

SAN LUIS POTOSÍ: Rascon, *Purpus* 5425.

TEPIC: Acaponeta, *Rose* 14253.

JALISCO: Tequila, *Palmer* 372 in 1886. Valley of the Río Grande de Santiago, *Pringle* 2423. Near Guadalajara, *Pringle* 2047.

MORELOS: Trimenta, *Orcutt* 4407. Valley of Cuantla, *Pringle* 8493. Cuernavaca, *Hitchcock* 6821, 6841.

COLIMA: Colima, *Palmer* 141 in 1897, 1256 in 1891. Alzada, *Hitchcock* 7070, 7091. Jala, *Hitchcock* 7007.

GUERRERO: Iguala, *Hitchcock* 6695. Balsas, *Hitchcock* 6805.

GUATEMALA: Patulul, *Heyde & Lux* 6401.

SALVADOR: San Salvador, *Renson* 301, 362. Sonsonate, *Hitchcock* 8977.

NICARAGUA: Corinto, *Hitchcock* 8614. Realejo, *Hitchcock* 8750.

COSTA RICA: Guadelupe, *Tonduz* 14480 (cultivated).

In a preceding paragraph it was stated that the genus Urochloa, to which *Ixophorus unisetus* was first referred, was based upon a single species, *U. panicoides* Beauv. (1812). A few years later (1816) Poiret described the same species as *Panicum javanicum*. In 1821 Trinius, in an article entitled *Agrostographische Beyträge*,[3] published an allied species from the East Indies, as *Panicum helopus*. Later authors confused the two species and Hooker in his *Flora of British India* unites them under the name *P. javanicum*. This author, who is much given to placing under one name several allied species, makes the following statement under *P. javanicum:* "Kunth (Revis. Gram. 1. 206) says, under *Urochloa panicoides*, that he has examined in Desfontaine's Herbarium the type of Poiret's *P. javanicum*, and identified it, which he cites as a syn. of *Urochloa panicoides*, but his figure of which again quite accords with a narrow-leaved form of *P. helopus*, Trin. This requires the adoption of the name *javanicum* (by misprint *japonicum* in Kunth Revis.) for the species. Bentham, on the other hand (*Fl. Austral.*, vii 477), says that Munro has seen an authentic specimen of *javanicum*, and that it is quite distinct from *P. helopus*. I have no means of verifying either authority." The original description of *P. javanicum* states that the spikelets are glabrous; the original description of *P. helopus* states that the spikelets are hirsute. Beauvois's figure, accompanying the original description of *Urochloa panicoides*, shows the spikelets to be glabrous. Thus one can easily distinguish the two species without consulting the evidence of which Hooker speaks.

The species with glabrous spikelets should be known as **Panicum panicoides** (Beauv.) Hitchc. (*Urochloa panicoides* Beauv. Ess. Agrost. 52. pl. 11. fig. 1. 1812; *Panicum javanicum* Poir. in Lam. Encycl. Suppl. 4: 274. 1816).

[3] Spreng. Neu. Entd. 2: 84. 1821.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. The abstracts should conform in length and general style to those appearing in this issue.

GEODESY.—*General theory of polyconic projections.* OSCAR S. ADAMS. U. S. Coast and Geodetic Survey, Spec. Publ. **57**. Pp. 174. pl. 1. figs. 48. 1919.

In this publication an attempt has been made to give a fairly complete treatment of the various systems of projection in which the parallels are represented by a group of non-concentric circles with the centers of these circles all lying upon a straight line. The number of such systems is unlimited; the aim has been, therefore, to give a development of the projections that are most frequently met with in practice. Some attention, however, is given to more general theoretical considerations in order to illustrate the way in which particular properties can be attained in a given projection by the introduction of analytical conditions in the mathematical definition of the projection.

In the treatment of any particular projection, the development is given first from the standpoint of the simpler geometrical or analytical principles upon which it is based, and later the same results are deduced from the more general principles that may be found to apply to the projection under consideration. This method of attack is found more rigidly applied in the case of the conformal polyconic projections than in the treatment of any other class in the polyconic group. The comparatively simple geometrical or analytical development is first given and this is followed by a development of the results by the employment of functions of a complex variable in accordance with the principles demonstrated by Gauss and Lagrange.

A full mathematical treatment of the ordinary or the American polyconic projection is given in the latter part of the volume. No adequate development of this has ever before been given in one volume in an American publication. Information in regard to it has been largely confined to articles in the various annual reports of the Superintendent of the U. S. Coast and Geodetic Survey, and the result has been that it was difficult to get copies of the articles on account of the exhaustion of the supply of the reports in which the articles were found.

This volume will, therefore, serve to meet the requirements of those who wish to have information with regard to the mathematical principles underlying this projection, which has always been extensively used in America. O. S. A.

PHYSICS.—*Some optical and photoelectrical properties of molybdenite.* W. W. COBLENTZ and H. KAHLER. Bur. Stand. Sci. Paper 338. Pp. 51. 1919.

This paper gives data on the transmissivity and the reflectivity of molybdenite; also data upon its change in electrical conductivity, when exposed to thermal radiations of wave-lengths extending from the ultra-violet into the extreme infra-red. The effect of temperature, humidity, intensity of the exciting light, etc., upon the photoelectrical sensitivity of molybdenite were investigated.

It was found that: (1) samples of molybdenite obtained from various localities differ greatly in sensitivity; (2) there are maxima of sensitivity in the region of 0.73 μ, 0.85 μ, 1.08 μ, and 1.8 μ; (3) there is no simple law governing the variation in the photoelectric response with variation in intensity of the radiation stimulus; (4) the increase in photoelectric current with increase in intensity of the incident radiation is greatest for infra-red rays. It is greatest for low intensities of the exciting light and it is greatest on the long wave-length side of the maximum; (5) the photoelectric sensitivity increases with decrease in temperature. At 70°C. the bands at 1.02μ and 1.8 μ have practically disappeared. On the other hand, at liquid air temperatures, the greatest change in electrical conductivity is produced by radiations of wave-lengths between 0.8 μ and 0.9 μ.

Unlike selenium, molybdenite appears unique in being photoelectrically sensitive to infra-red rays, extending to about 3 μ. W. W. C.

BOTANY.—*Flora of the District of Columbia and vicinity.* A. S. HITCHCOCK and PAUL C. STANDLEY, with the assistance of the botanists of Washington. Contr. U. S. Nat. Herb. 21. Pp. 329. pls. 42. fig. 1. 1919.

The area included by the Flora is approximately a circle of 15 miles radius, with the Capitol as the center. The formal list includes all indigenous plants and all introduced ones that have become established. All the species admitted to the list are based upon specimens in the District Flora Herbarium, which has been segregated from the main collection of the National Herbarium. Species reported but which are

not supported by specimens are mentioned in notes. All the species mentioned in Ward's Flora (the standard list of the region up to the present) and its Supplements have been accounted for, even though they cannot now be verified by specimens, some in synonymy and some as being errors of identification. There are formally listed 646 genera and 1630 species, and many more are mentioned in notes as being waifs. There are two keys to families, one based mainly upon vegetative characters, the other mainly upon floral characters. There are also keys to genera and to the species. Under each species is mentioned the common name, the habitat, the distribution in the District, the flowering period and the general distribution. An introduction gives a brief history of botanical activity in the District and a short account of the geologic and ecologic features of the region. The work concludes with a Glossary and Index and is accompanied by 42 plates giving 57 halftones, some illustrating the ecologic features of the flora, others several of the interesting species. A. S. H.

ORNITHOLOGY.—*Washington region.* (February and March, 1918.) HARRY C. OBERHOLSER. Bird Lore **20**: 231–32. 1918.

February and March are usually the least favorable months for bird observations about Washington. In the year 1917, however, these months were notable for the many ducks which frequented the Potomac River. Two species, *Marila americana* and *Spatula clypeata*, both of which are rare about Washington, particularly in the spring, were observed in March. Furthermore, *Nettion carolinense* and *Aristonetta valisineria* remained later than ever before. Notwithstanding the very severe winter a number of early migrants appeared considerably ahead of their schedule; *Fulica americana* on March 9, earlier than any previous record. Some species, such as *Regulus satrapa*, *Nannus hiemalis hiemalis*, and *Sitta canadensis canadensis* have been unusually scarce; others, such as *Passerella iliaca*, at times more than commonly numerous. H. C. O.

ORNITHOLOGY.—*Notes on North American birds. VII.* HARRY C. OBERHOLSER. Auk **36**: 81–85. January, 1919.

An investigation of the American *Nettion carolinense* shows that this bird is clearly a distinct species and not a subspecies of the European *Nettion crecca*. On the other hand, *Circus hudsonius* (Linnaeus) proves to intergrade individually with *Circus cyaneus* of Europe, and should, therefore, stand as *Circus cyaneus hudsonius* (Linnaeus). The gray

sea eagles from eastern Asia prove to be subspecifically different from the European *Haliaeetus albicilla* and should be called *Haliaeetus albicilla brooksi* Hume. The birds of this species occurring on the Aleutian Islands belong, of course, to this race, and *Haliaeetus albicilla brooksi* is thus added to the North American list. The American bird now called *Larus brachyrhynchus* proves to be only subspecifically different from *Larus canus* of Europe, and its name, therefore, should be *Larus canus brachyrhynchus*. Although *Corvus caurinus* Baird has been commonly considered a distinct species, there is apparently nothing in either size or color to warrant its status as other than a subspecies. It, therefore, should hereafter be called *Corvus brachyrhynchus caurinus* Baird. The golden warbler commonly known as *Dendroica bryanti castaneiceps* Ridgway proves now to be a subspecies of *Dendroica erithachorides* Baird, since *Dendroica bryanti* is found to intergrade with the latter. Its name, therefore, should be *Dendroica erithachorides castaneiceps* Ridgway. H. C. O.

ORNITHOLOGY.—*Mutanda ornithologica. V.* HARRY C. OBERHOLSER. Proc. Biol. Soc. Wash. **32**: 7–8. Feb. 14, 1919.

The woodpecker now known as *Iyngipicus auritus* (Eyton) has an earlier name, and should therefore be known as *Yungipicus moluccensis* (Gmelin). The names of four other woodpeckers are preoccupied and they, therefore, require changing as follows: *Iyngipicus pygmaeus* (Vigors) becomes *Yungipicus mitchellii* (Malherbe); *Dendropicos minutus* (Temminck) is here renamed *Dendropicos elachus*. *Campethera punctata* (Valenciennes) will now stand as *Campethera punctuligera* (Wagler); and *Gecinus striolatus* (Blyth) becomes *Picus xanthopygius* (Bonaparte). H. C. O.

ORNITHOLOGY.—*Mutanda ornithologica. VI.* HARRY C. OBERHOLSER. Proc. Biol. Soc. Wash. **32**: 21–22. Apr. 11, 1919.

The changes in the names of birds on account of preoccupation or overlooked earlier names here made concern five species. The bird commonly known as *Francolinus chinensis* (Müller) must now stand as *Francolinus pintadeanus* (Scopoli); *Totanus maculatus* (Tunstall) becomes *Totanus erythropus* (Pallas); *Cuculus canorus minor* Brehm is named *Cuculus canorus bangsi; Monasa nigra* (Müller) becomes *Monasa atra* (Boddaert); and *Alcedo grandis* Blyth is now to be called *Alcedo megalia*, nom. nov. H. C. O.

ORNITHOLOGY.—*A review of the plover genus Ochthodromus Reichenbach and its nearest allies.* HARRY C. OBERHOLSER. Trans. Wis. Acad. Sci. **19:** Pt. 1. 511–523. Dec., 1918.

The present study originated in the desire to determine the proper generic name for the plover commonly known as *Ochthodromus wilsonius* (Ord). It resulted in an examination of not only all the species commonly referred to the genus *Ochthodromus*, but some of other genera as well. The eleven species concerned are found to represent the following seven genera: *Eupoda* BRANDT, *Pernettyva* MATHEWS, *Pluviorhynchus* BONAPARTE, *Pagoa* MATHEWS, *Pagolla* MATHEWS, *Cirrepidesmus* BONAPARTE, and *Charadrius* LINNAEUS. The synonymy of each of these genera, together with its detailed characters and a discussion of its relationships and nomenclature forms the main portion of this paper. The chief changes from the conclusions of the latest reviser of the group are as follows: The generic name *Eupoda* BRANDT is used in place of *Eupodella* MATHEWS; the current genus *Podasocys* Coues is found to be inseparable from *Eupoda*, and its only species should, therefore, now stand as *Eupoda montana;* the subgenus *Pernettyva* MATHEWS, instituted as a subgenus for *Charadrius falklandicus* Latham, is raised to a full genus and includes *Ochthodromus bicinctus* (Jardine and Selby); the generic name *Pagolla* MATHEWS should replace *Ochthodromus* REICHENBACH because preoccupied by *Ochthedromus* LeConte, and its only species, therefore, becomes *Pagolla wilsonia* (Ord). H. C. O.

ORNITHOLOGY.—*Description of a new subspecies of Piranga hepatica Swainson.* HARRY C. OBERHOLSER. Auk **36:** 74–80. January, 1919.

The original description of *Piranga hepatica* was based on a specimen from the State of Hidalgo, Mexico, and the typical race of the species is, therefore, that from central Mexico. Birds from more northern localities now prove to be subspecifically different in their larger size and darker coloration. They form, therefore, an additional new subspecies, *Piranga hepatica oreophasma*, which ranges from western Jalisco, Mexico, north to central western Texas and northwestern Arizona. H. C. O.

ORNITHOLOGY.—*Description of an interesting new Junco from Lower California.* HARRY C. OBERHOLSER. Condor **21:** 119–120. June 6, 1919.

The form of the genus *Junco* inhabiting the Hanson Laguna Mountains in northern Lower California is of considerable interest, since it

forms the connecting link between *Junco oreganus thurberi* of California, and *Junco oreganus townsendi* of the San Pedro Martir Mountains in Lower California, and indicates that the latter is, without doubt, a subspecies. Confined as it is to this single group of mountains and possessed of sufficiently distinctive characters, it is found to be subspecifically distinct from all the other known forms of the genus and is, therefore, named *Junco oreganus pontilis*. H. C. O.

ORNITHOLOGY.—*Fourth annual list of proposed changes in the A. O. U. check list of North American birds*. HARRY C. OBERHOLSER. Auk **36**: 266–273. 1919.

The Fourth Annual list of proposed additions and changes made for zoological reasons in the names of North American birds includes everything pertinent up to December 31, 1918, inclusive. The total number of additions and changes amount to 51, the additions being 26 subspecies, 2 species, 1 subgenus, and 1 genus. The rejections and eliminations from the list total 19, of which the eliminations of subspecies amount to 5, species 2, and genera 2. This leaves a net gain of 21 species and subspecies. H. C. O.

ORNITHOLOGY.—*A revision of the subspecies of the white-collared kingfisher, Sauropatis chloris (Boddaert)*. HARRY C. OBERHOLSER. Proc. U. S. Nat. Mus. **55**: 351–395. 1919.

Birds allied to *Sauropatis chloris* present a difficult problem to the systematist, chiefly because of the great amount of variation, sexual, seasonal, and individual, in both size and color. They seem to represent a genus distinct from *Halcyon*, in which group they have usually been placed. Most of them are subspecies of *Sauropatis chloris*, although a number now thus regarded have heretofore been considered distinct species. As here understood the species *Sauropatis chloris* ranges from the Philippine Islands, India, and Abyssinia, south to Java and northern Australia, and east to the Fiji Islands. The number of subspecies here recognized is 24; and it is interesting to note that of these only six, including three found in Australia, are continental in distribution. Each is treated more or less at length, and in most cases, with the addition of tables of measurements. The following new subspecies are described: *Sauropatis chloris palmeri* from Java; *Sauropatis chloris azela* from Engano Island, western Sumatra; *Sauropatis chloris chloroptera* from Simalur Island, western Sumatra; *Sauropatis chloris amphiryta* from Nias Island, western Sumatra; and *Sauropatis chloris hyperpontia* from Vaté Island in the New Hebrides group. H. C. O.

CHEMICAL TECHNOLOGY.—*The identification of "stones" in glass.* (Geophysical Lab. Papers on Optical Glass No. 4.) N. L. BOWEN. Journ. Amer. Ceramic Soc. **1**: 594–605. Sept. 1918.

The petrographic microscope is a convenient and efficient instrument for the determination of the nature and origin of "stones" or crystalline particles occurring in glass. Stones are divided into four classes: (1) pot stones, (2) batch stones, (3) crown drops, (4) devitrification stones. These classes have distinctive features of structure and texture that are revealed by the microscope. Moreover, the crystalline phases contained in stones can be identified by a determination of their optical properties. The results of a study of stones by these methods are given in this paper. N. L. B.

CHEMICAL TECHNOLOGY.—*The condition of arsenic in glass and its rôle in glass-making.* (Geophysical Lab. Papers on Optical Glass No. 6.) E. T. ALLEN and E. G. ZIES. Journ. Amer. Ceramic Soc. **1**: 787–790. Nov., 1918.

Analyses show that in all the glasses tested, both plate and optical glasses, the major part of the arsenic present exists in the pentavalent state, but nevertheless a portion exists in the trivalent state. It appears that arsenic trioxide is oxidized at a low temperature and the product formed is stable enough to remain until a high temperature is reached and the glass becomes fluid, when it slowly dissociates into oxygen and arsenic trioxide, both of which aid in the fining. E. T. A.

CHEMICAL TECHNOLOGY.—*Constitution and microstructure of silica brick and changes involved through repeated burnings at high temperature.* HERBERT INSLEY and A. A. KLEIN. Bur. Stand. Tech. Paper **124**. Pp. 31. pls. 10. 1919.

The investigation involves a petrographic microscopic study of test cubes and commercial silica brick, some of which had received repeated burnings by use in kilns. Quartz, cristobalite, and tridymite are the main constituents. Small amounts of pseudowollastonite and glass are present. Long burning at temperatures slightly less than 1470°C. causes the formation of a large percentage of tridymite. Cristobalite characterizes higher burned brick. Quartz first inverts to cristobalite in the fine grained ground mass and along cracks caused by shattering on heating, and then to tridymite if the temperature does not exceed 1470°C. The lime added in grinding aids more as a flux than as a bond. Most of the cementing action in the burned product comes from the interlocking of the quartz, cristobalite, and tridymite crystals. H. I.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

BOTANICAL SOCIETY OF WASHINGTON

136TH MEETING

The 136th regular meeting of the Botanical Society of Washington was held in the Assembly Hall of the Cosmos Club at 8 p. m., Tuesday, May 6, 1919, forty-three members and two guests being present. The program consisted of the following papers:

Agricultural explorations of Frank N. Meyer (with lantern): DAVID G. FAIRCHILD. The speaker gave a brief account of the life and work of Mr. Meyer, illustrating his talk by lantern slides made from pictures taken by the explorer in China and other parts of Asia. Meyer was a Hollander by birth and spent his childhood among the gardens of Amsterdam, rising through his own talents to be the assistant of Hugo de Vries. His passion for travel took him on foot across the Alps and into Italy to see the orange groves and vineyards of the Mediterranean and later led him to explore America and northern Mexico on foot. His first expedition in the years 1905–8 was into North China, Manchuria, and northern Korea; his second, in 1909–11, through the Caucasus, Russian Turkestan, Chinese Turkestan, and Siberia; his third, in 1912–15, through northwestern China into the Kansu Province to the borders of Tibet, and his last expedition in search of plants began in 1916 when he went in quest of the wild pear forests in the region of Jehol, north of Peking, and the region around Ichang. He was caught at Ichang by the revolution and for many months was unable to escape. The confinement and uncertainty with regard to the great war, together with an attack of illness, had by this time combined to bring on a recurrence of a former attack of what amounted to nervous prostration, and before he could reach the encouraging companionship of people of his own class he was drowned in the Yangtze River near the town of Wu Hu, thirty miles north of Nanking. He has sent in hundreds of shipments of living cuttings and thousands of sacks filled with seeds of the useful plants of the countries through which he traveled, which are growing successfully in American fields and orchards, and has rendered great service to our horticulture by showing us what the Chinese have done to improve their native fruits.

Agricultural explorations in Guatemala (with lantern): WILSON POPENOE The avocado is being planted commercially in California

and Florida, and its cultivation seems likely to become important in those States. In order that this new industry may be built upon solid foundations the Department of Agriculture, through the Office of Foreign Seed and Plant Introduction, has undertaken to conduct an exploration of those parts of tropical America where avocados are grown, for the purpose of obtaining the best available varieties as well as information regarding the requirements of the tree. The work in Guatemala, which extended over sixteen months in 1916 and 1917, resulted in the introduction of about 25 new and promising sorts.

The avocado is the principal fruit tree of the Guatemalan highlands, and ranks alongside the banana as a source of human food. The Guatemalan Indians use it largely in the place of meat. The tree is found in Guatemala at all elevations between sea-level and 8500 feet, at which latter altitude severe frosts occur. It is significant that avocados are grown in regions which are considered too cold for the orange, the latter fruit not being found above 7500 feet.

In addition to avocados, numerous other plants were obtained and introduced into the United States. These include several varieties of the chayote, a promising new vegetable for the South; the large-fruited Guatemalan haw, *Crataegus stipulosa;* the Central American cherry, *Prunus salicifolia;* choice varieties of the cherimoya for cultivation in California; a beautiful dwarf Chamaedorea which gives promise of being valuable as a house plant; two new dahlias, one a double-flowered tree dahlia which has been named *D. maxonii*, and the other a smaller plant, considered by W. E. Safford, who has named it *D. popenovii* to be one of the ancestors of the cultivated race of cactus dahlias; the beautiful blue-flowered Guatemalan lignum-vitae, *Guaiacum guatemalense*, which promises to do well in Florida; a new blue-flowered Salvia; and the little-known ilama, *Annona diversifolia*, a fruit which resembles the cherimoya and deserves to be cultivated in all tropical countries.

Carbon monoxide, a respiration product of Nereocystis luetkeana: SETH C. LANGDON and W. R. GAILEY (by invitation). The data contained in this paper were obtained at Puget Sound Marine Station in an investigation to determine if the carbon monoxide present in the pneumatocysts of the giant Pacific Coast kelp was an intermediate step in photosynthesis or a respiratory product. It was found that carbon monoxide was formed only when oxygen was present in the gas. The carbon monoxide was produced just as readily in the dark as in the light, hence its formation is related to respiration rather than to anabolic processes.

SPECIAL MEETING

The Botanical Society of Washington met at the Cosmos Club at 8 p.m., July 1, 1919, in special session in honor of Dr. A. D. COTTON, Royal Botanical Garden, Kew, England, Pathologist to the Board of Agriculture and Fisheries of England and Wales; Dr. GEO. H. PETHYBRIDGE, Economic Botanist to the Department of Agriculture and Tech-

nical Instruction of Ireland; and Dr. H. M. QUANJER, Plant Pathologist of the Institute for Phytopathology at Wageningen, Holland.

In response to an informal welcome by the President of the Society, Dr. KARL F. KELLERMAN, Dr. COTTON told the Society of the condition of botanical work in England and the effect of the war on the universities and the research laboratories. While serious losses to the personnel have come through the war, economic work has been stimulated. A research institute and an institute of applied botany have been established at Rothamsted. The British Mycological Society is more and more recognizing plant pathology.

Dr. PETHYBRIDGE explained that the war had stimulated a great development of food production in Ireland and that it had brought a recognition of the value of economic biological work. There is a small but active group of men in Ireland interested in natural history.

Dr. QUANJER called attention to the fact that Holland is a small country, being only about one-one hundred and sixtieth of the United States, yet it has produced in the past and present a goodly number of botanists and has several well-developed university departments of botany. After referring briefly to the botanical work of Lotsy, Oudemann, De Vries, Beyerinck, Treub, Ritzema Bos, Wakker, Van Hall, and others, he discussed the difficult group of plant diseases which includes mosaic of tobacco, leaf-roll and mosaic of potato, the Sereh disease of sugar cane, a dwarfing of a Japanese mulberry, and an infectious mosaic of the ornamental Abutilon. These diseases, he said, are probably due to ultra-microscopic organisms.

CHAS. E. CHAMBLISS, *Recording Secretary.*

SCIENTIFIC NOTES AND NEWS

MATTERS OF SCIENTIFIC INTEREST IN CONGRESS[1]

The Finance Committee of the Senate, which has had before it the bill for a tariff on scientific supplies (H. R. 7785), decided on October 3 to postpone all revenue and tariff matters until after the treaty of peace had been acted upon.

During the hearings on the bill the Tariff Commission prepared a report entitled *Information concerning scientific instruments*, which has been recently published. The report brings together a large number of opinions and arguments concerning the tariff on scientific supplies, received from various sections of the Bureau of Standards, from manufacturers of instruments of all kinds, and from universities and organizations.

Two distinct questions are involved: (1) Should Congress repeal the privilege, now granted to institutions of learning, of importing supplies free of duty? (2) Should the present rates be increased and imported articles now on the free list be taxed?

The opinions quoted are not analyzed in the report, but the following brief outline will indicate that those interested are still far from being in agreement. (Definite recommendations only are counted.)

(1) Of eleven university professors quoted, one favors and ten oppose repeal of the duty-free clause. Of twelve opinions from the Bureau of Standards, five favor and seven oppose repeal. Of seven manufacturers quoted on this subject six favor and one opposes repeal. The Council of the American Chemical Society is quoted in favor of repeal of the duty-free clause, "for a reasonable period of years, at least."

(2) Opinions on the subject of the imposition and increase of tariff rates on scientific supplies are quoted as follows: Ten manufacturers, all in favor of higher tariff; eleven sections of the Bureau of Standards, seven in favor and four against. The Commission believes that "the extremely diverse nature of the products falling under such a general designation as 'scientific instruments' renders general statements concerning the entire group of little value for the purpose of deciding on any rates of duty related to the competitive conditions which affect individual instruments."

The report also discusses in a general way the status of the domestic industry, imports and exports, tariff history, competitive conditions, and war developments.

A conference of campaign committees, delegates from affiliated engineering, architects', and constructors' societies, and other interested parties, is planned for some time in November, to give active support to the JONES-REAVIS bill for a National Department of Public Works.

[1] Preceding report: This JOURNAL. 9: 535. 1919.

On October 6 Mr. FRANCE, chairman of the Senate Committee on Public Health and National Quarantine, asked unanimous consent to consider S. J. Res. 76, providing for an investigation of the cause and methods of prevention of influenza and allied diseases. Mr. SMOOT objected, and no action was taken on the resolution.

The Senate resolution concerning the Botanic Garden (S. Res. 165) was taken from the table on August 23 and referred to the Committee on the Library, together with the report of the Fine Arts Commission. This report recommends the acquisition of 400 acres on Mount Hamilton, in the northeastern quarter of the District, as a site for "an adequate national botanic garden and arboretum." It will be recalled that the earliest scientific society in the District of Columbia, the Columbian Institute, organized in 1816, was the founder of the Botanic Garden, which was afterwards turned over to the Federal Government but still occupies its original grounds at the western base of Capitol Hill.

NOTES

The United States Geological Survey is about to supervise extensive topographic mapping in the West Indies. The Republics of Santo Domingo and Haiti have made appropriations sufficient to complete the surveys of their countries and have requested the Geological Survey to take charge of the work and to furnish the technical personnel. It is probable that Porto Rico and the Republic of Cuba will take similar action. In order to provide for the administration of this work a Division of West Indian Surveys has been created in the Topographic Branch. Lieut. Col. GLENN S. SMITH has been relieved from his duties in connection with military surveys and has been designated as Topographic Engineer in Charge of the new division. Field work in the Dominican Republic has already been started with an organization of five parties having a force of approximately sixty men which will be gradually increased to ten parties as the work progresses. It is expected that the survey of this Republic will be completed within four years.

The glass work and the chemical part of the cement investigation work of the Bureau of Standards, which has been located for several years at the U. S. Arsenal buildings at 40th and Butler Streets, Pittsburgh, Pennsylvania, has been transferred to Washington. Mr. P. H. BATES, director of the Pittsburgh branch, is now located in the new Industrial Building of the Bureau. Mr. A. V. BLEININGER, chief ceramic chemist of the Bureau, will move to Washington in the near future.

The following educational courses are being given at the Bureau of Standards this winter: *A. Advanced theoretical mechanics*, W. S. GORTON; *B. Harmonic functions*, D. R. HARPER; *C. Introduction to mathematical physics*, L. B. TUCKERMAN; *D. Thermodynamics*, L. H. ADAMS; *E. Colloidal chemistry*, W. D. BANCROFT. Dr. C. W. KANOLT is chairman of the committee in charge.

Mr. JOHN BOYLE, JR., assistant examiner in the Patent Office, has resigned his position and will open an office in Washington for the practice of patent law.

Dr. F. C. BROWN, formerly associate professor of physics at the University of Iowa, has been appointed technical assistant to the director of the Bureau of Standards. During the war he was commissioned major in the Ordnance Department of the Army, and was engaged in research on problems of aircraft armament.

Mr. E. R. CLARK, of the Bureau of Standards, has resigned to accept a position with the Standard Textile Products Company of New York City.

Mr. JOHN B. FERGUSON has presented his resignation from the Geophysical Laboratory, Carnegie Institution of Washington, to be in effect November 1, and has accepted a research position with the Western Electric Company in New York City.

Messrs. A. N. FINN and L. J. GUREVICH, of the Bureau of Standards, have resigned to accept positions as Chief of the Technical Section of the Development Department, and Research Metallurgist, respectively, with the Hydraulic Pressed Steel Company of Cleveland, Ohio.

Dr. H. D. GIBBS, of the Bureau of Chemistry, has resigned to take up work with E. I. du Pont de Nemours and Company, of Wilmington, Delaware.

Mr. H. D. HOLLER has resigned from the Bureau of Standards and is now at the Parlin Laboratory of E. I. du Pont de Nemours and Company, of Wilmington, Delaware.

Mr. F. J. KATZ has been granted leave of absence from the Mineral Resources division of the U. S. Geological Survey in order to accept an appointment as Expert Special Agent in charge of Mines and Quarries for the Bureau of the Census. This arrangement is to insure close and effective coöperation between the two bureaus in the Fourteenth Census.

Mr. WILLIS T. LEE, geologist of the Geological Survey, will be absent from Washington until February, 1920, in order to deliver a course of lectures at Yale University.

Mr. RICHARD B. MOORE, until recently stationed at the Bureau of Mines' experiment station at Golden, Colorado, has been appointed chief chemist of the Bureau, to succeed Dr. C. L. PARSONS, resigned.

MR. J. G. RILEY, formerly with the Bureau of Chemistry, and recently Captain in the Sanitary Corps, is now in the laboratory of the Bureau of Internal Revenue, Treasury Department.

Mr. F. J. SCHLINK, a member of the staff of the Bureau of Standards since 1913, and for the past two years technical assistant to the Director, has resigned to carry on physical research for the Firestone Tire and Rubber Company of Akron, Ohio. Mr. Schlink recently received an award of the Edward Longstreth Medal of the Franklin Institute for his invention of an improved type of weighing scale.